Using NAST-I in Support of GOES-R Proxy Data

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INTRODUCTION AND SUMMARY

➤ The NPOESS Airborne Sounder Testbed – Interferometer (NAST-I) has been successfully operating on high altitude aircraft (i.e., ER-2 and Proteus) since 1998. NAST-I was designed to provide radiometric measurements similar to those being obtained from present and future satellite sensors such as the AIRS, the GIFTS, the IASI, the CrIS, and HES.

➤ NAST-I provides high-spatial resolution (~2.5 km) and high-spectral resolution (0.25 cm^{-1}) measurements within a spectral region of 645–2700 cm^{-1}. Because of its spectral resolution and coverage, it is an ideal instrument to generate proxy data for new sensor and algorithm development.

➤ High quality and realistic proxy data from NAST-I which represents a large variety of atmospheric and surface conditions will be provided for GOES-R satellite instrument and algorithm development. The plan for NAST-I to fulfill GOES-R proxy data requirements is addressed.
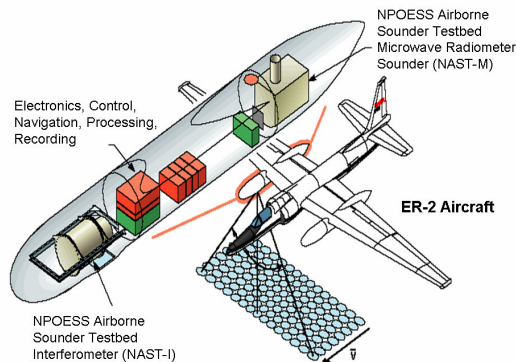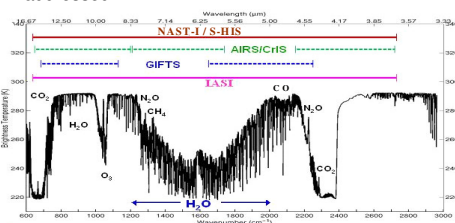
NAST-I HAS DEMONSTRATED ITS CAPABILITIES TO PROVIDE HIGH QUALITY DATA OF ATMOSPHERIC SOUNDING, CHEMISTRY, CLOUDS, AND WIND

Hybrid Retrieval Algorithm Dealing with Clouds of Ultraspectral Observations:

➤ Cloud detection on observations.

➤ Retrieval of cloud microphysical parameters.

➤ Retrieval of temperature and moisture sounding profiles.

➤ Cloud and thermodynamics retrievals can be used for the direct assimilation of radiances into a forecast model.

➤ Beneficial to current/future satellite instruments and the usage of cloudy hyperspectral data.
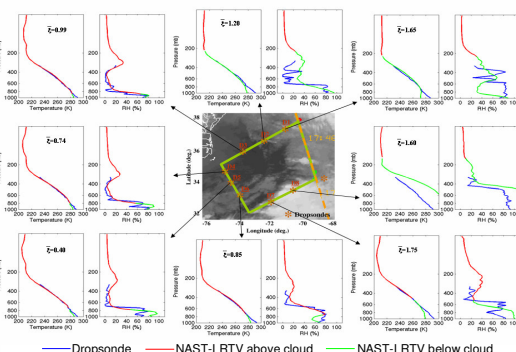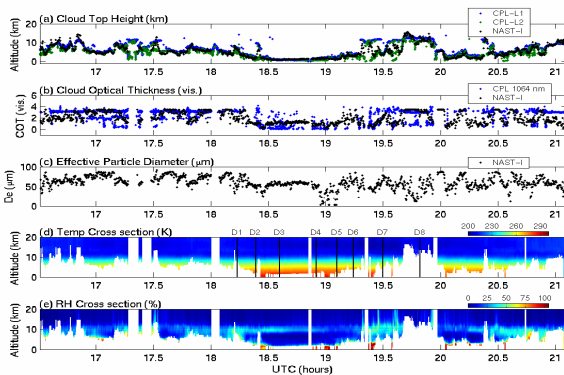

Retrieval of Trace Species:

➤ Temperature, moisture, Ozone and CO simultaneously retrieved.

➤ A tool for retrievability investigation for future sensors (i.e., CrIS, ISAI, and HES).

➤ NAST-I science data products can provide high spatial regional atmospheric information.

➤ Provide spaceborne measurement validation.

➤ Provide proxy data for new instrument development
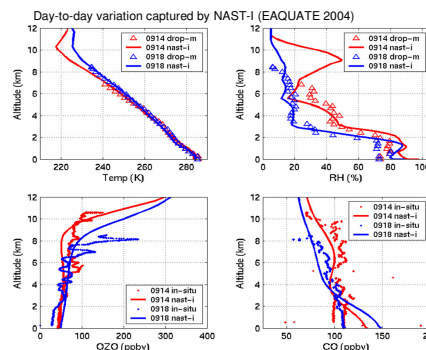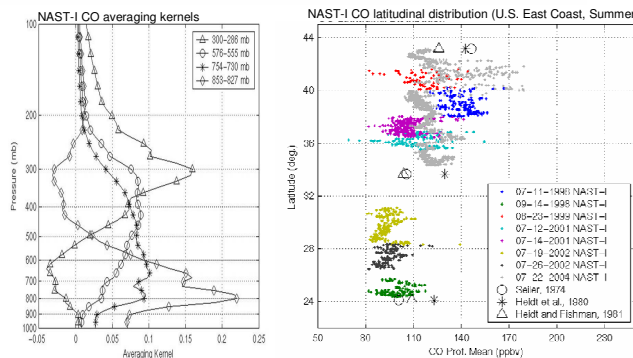
NAST-I HAS PROVIDED GIFTS AND CRIS PROXY DATA TO DEMONSTRATE INSTRUMNETAL CAPABILITIES

(A) NAST-I radiance degraded to a full CrIS, unapodized, spectral resolution (0.625 cm^{-1} for all bands). Noise level is reduced accordingly.

(B) NAST-I radiance degraded to current CrIS, unapodized, spectral resolution (0.625, 1.25, and 2.5 cm^{-1} for band 1, 2 and 3, respectively). Noise level is reduced accordingly.
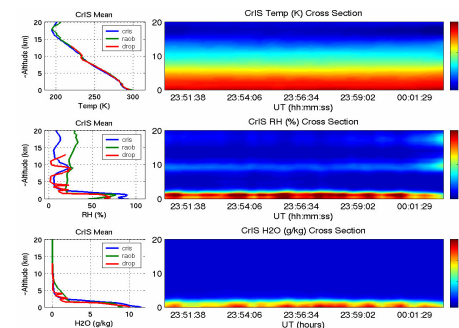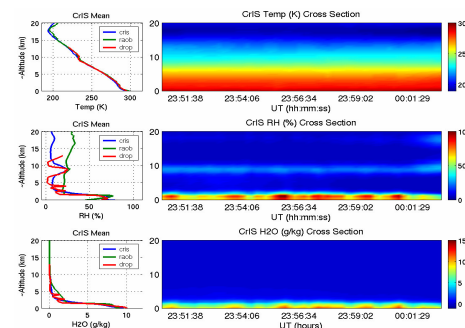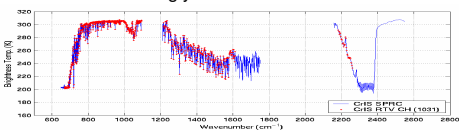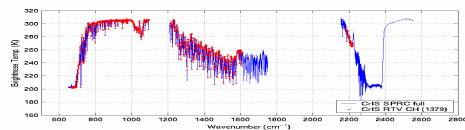
PLAN FOR GOES-R PROXY DATA GENERATION AND ANALYSIS:

The objectives for GOES-R proxy data generation using NAST-I are identified and the plan is:

➤ to identify proper cases useful to GOES-R AWG

➤ to develop NAST-I level 2 data (geophysical retrievals) with the most updated state-of-art retrieval algorithms, and perform sample validations and quality control

➤ to generate HES-like radiances with direct convolution (with original NAST-I instrument noise)

➤ to generate HES-like radiances with forward model simulations based on NAST-I retrievals (without noise or with a specific noise input)

➤ to interact with AWG members to fulfill the needs of NAST-I and the GOES-R AWG collaboration.

The cases/categories important to the AWG can be in the areas of: (1) clear radiances and associated retrieval soundings of temperature and moisture for retrieval algorithm development and analyses and instrument trade and sensitivity studies, (2) the thermodynamic and cloud microphysical properties retrieved from NAST-I which can be used for directly assimilating cloudy radiance into a forecast model, (3) clear and/or cloudy retrievals from a temporally-repeated geophysical area, which can be used for deriving moisture-traced winds, and (4) retrieval of chemical species such as ozone and carbon monoxide for air quality applications.